M E M O R A N D U M

TO: Tiffany Floyd, Acting Engineering Manager, Boise Regional Office

FROM: Paul Wakagawa, Technical 1 Engineer, Boise Regional Office

DATE: November 15, 2006

SUBJECT: Staff Analysis for the North Lake Recreational Sewer & Water District Wastewater Reuse Permit Application, LA-000070-03 (Municipal Wastewater)

PURPOSE

The purpose of this memorandum is to satisfy the requirements of the *Reclamation and Reuse of Municipal and Industrial Wastewater Regulations*, (Reuse Rules) IDAPA 58.01.17.700 for issuing wastewater reuse permits.

PROCESS DESCRIPTION

The City of Donnelly (City) and the North Lake Recreational Sewer & Water District (District) are the two public entities served by this municipal wastewater collection and treatment system. These two entities share costs for the operation of the treatment plant located southwest of the City.

The existing system consists of five lagoons. The first two lagoons are aerated (aeration added to lagoon no. 2 in 2006), a polishing lagoon, and two winter storage lagoons. Effluent is disinfected with chlorine and used to irrigate property to the north and south of the lagoon system.

Due to rapid development in the service area, the District is planning to expand treatment capacity by adding a membrane bioreactor (MBR) system with ultraviolet disinfection and discharge to a rapid infiltration site located west of the Lake Fork arm of Cascade Lake. This system is projected to be started up in the fall of 2007.

The new permit will cover existing slow rate land application and the new MBR and rapid infiltration system.

SUMMARY OF EVENTS

Permit LA-000070-02 was issued to the City of Donnelly on October 16, 1997 with an expiration date of October 10, 2002. Applications to renew the permit were submitted by both the City and District on May 20, 2003 and May 2, 2003, respectively. Instead of pursuing separate permits, the City and District signed an agreement, dated June 2005, regarding ownership, operation, and maintenance of the wastewater collection and treatment facilities and made the District responsible for operation and management of the wastewater treatment system.

DEQ received a *Preliminary Technical Report for Reuse Permit Application for Wastewater Land Application, January 2006* on February 7, 2006 prepared by Keller Associates. DEQ provided comments on the application on March 21, 2006 and a revised *Preliminary Technical Report for Reuse Permit Application for Wastewater Land Application, Rev. March 2006* (Application 2006) was received on March 29, 2006. Additional DEQ comments on Application 2006 were provided on May 22, 2006. On

June 26 and June 30, 2006, Keller Associates provided letters responding to the DEQ comments. On July 6, 2006, Keller Associates provided additional information regarding the proposed rapid infiltration site no. 1.

On July 26, 2006, DEQ received a letter from the Department of the Army, Corps of Engineers that the rapid infiltration site no. 1 was no longer considered a jurisdictional wetland and would not require approval by the Department of the Army.

On August 14, 2006, DEQ issued a determination that the permit application was complete.

On August 24, 2006, DEQ conducted an inspection at the District wastewater treatment plant, slow rate land application fields, and the proposed site for the rapid infiltration basin system. Based on the inspection, several items were noted that required District action as part of the permitting process. A letter was sent to the District on September 1, 2006 (Attachment 2) identifying the action items.

In addition to the permit related activities, the District has submitted facility planning documents and plans and specifications for the expansion of the treatment system. The following documents have been approved by DEQ:

1. *2005 North Lake Facilities Planning Study Addendum, Final July 2006* (FPS 2006), DEQ approved August 22, 2006.
2. *Wastewater Collection System Master Plan Supplement to the 2005 North Lake Facilities Planning Study Addendum, July 2006* (Collection System 2006), DEQ approved August 22, 2006.
3. District plans and specifications for lagoon no. 2 aeration and winter storage lagoon no. 5 expansion, DEQ approved July 12, 2005.
4. North Lake Recreational Sewer and Water District Phase 2, Mechanical Treatment Plant, SRF Loan 1899-18, DEQ approved August 22, 2006.

DESCRIPTION OF WASTEWATER SYSTEM

The sewer collection system served by the treatment system is shown in **Figure 2-1, *Existing NLRSWD Collection System* (Collection System 2006), attached.** The existing collection system serves the following major areas: Big Smoky/Morning Dawn, City of Donnelly, Day Star, Edwards, Hillhouse, Tamarack Resort, and Wagon Wheel. It is expected an additional area west of Lake Cascade and north of Tamarack Resort called the Westwood area will require sewer service in the next several years.

The treatment facilities consist of a three treatment lagoons, a winter storage lagoon for the City, and a winter storage lagoon for the District. The treatment lagoons consist of a complete mix, aerated lagoon no. 1, followed by two polishing lagoons (lagoon nos. 2 and 3). In 2006, aeration was added to lagoon no. 2 to increase complete mix treatment capacity and storage lagoon no. 5 capacity was increased by constructing a wall at the top of the dike. A summary of the lagoon system is shown in Table 1.

Table 1. District Wastewater Lagoons

Lagoon	Type	Volume, MG	Note
1	Aerated, Complete Mix	2.80	
2	Aerated, Complete Mix	1.40	Aeration added to lagoon in 2006
3	Polishing	1.54	

Lagoon	Type	Volume, MG	Note
4	Winter Storage Lagoon, City	8.2	
5	Winter Storage Lagoon, District	52.6	Additional capacity added in 2006 to increase to 52.6 million gallons

Effluent from the lagoon system is disinfected with chlorine and used to irrigate properties north and south of the treatment system.

The property to the north is owned by the Stevens Family Trust (Stevens). An agreement between the District and Stevens was signed on May 27, 2003 for a term of 10 years. The area consists of two fields referred to as Fields 2 and 3.

Field 2 (65 acres) is currently being used for land application of effluent using wheel lines and is used for native pasture grasses. 25 to 40 horses are grazed in the field.

Field 3 (35 acres) is a new, proposed field for inclusion in the renewal permit. Field 3 is vegetated with pasture grasses and native trees. At this time, insufficient information is available to characterize this field and it will not be included in the permit.

The property to the south is owned by Larry and Arlene Eld (Eld). An agreement between the District and Eld was signed on March 16, 2004 for a term of 15 years ending the irrigation season of 2018. The Eld property is used for pasture, crops, and a tree farm. The permit application requests re-permitting of the Eld field designated as Field 1. Application 2006 showed Field 1 was 80 acres. Keller Associates provided updated maps on November 9, 2006 showing Filed 1 covered 104 acres. The current crops are grass hay which is harvested once per year and a tree farm. Approximately 20 pairs of cattle are grazed in the field in the fall following harvest.

The lagoon system and associated land application facilities have a design capacity of 0.38 MGD during the summer and 0.21 MGD in the winter (FPS 2006, Chapter 7, page 2).

Note: The District agreements with Eld and Stevens will require modification after the permit is issued to reflect the permit requirements regarding operation of the effluent irrigation equipment, the grazing management plan, and actual areas approved for reuse irrigation.

The plans to increase treatment capacity consist of an advanced activated sludge plant incorporating a micro-filtration membrane system to filter effluent, also referred to as a membrane bioreactor or MBR. The system is designed for a capacity of 1.0 MGD with provisions to expand to 1.25 MGD. Chemical phosphorus removal is included to meet a 0.1 mg/l total phosphorus level in the final effluent. The lagoon system is being retained for existing capacity and to provide flow equalization for peak flow events for the MBR system.

MBR effluent will be disinfected in an ultraviolet system. The system is designed to produce a final effluent meeting Class B effluent quality requirements as defined in IDAPA 58.01.17 (Reuse Rules).

Final effluent from the MBR system will be pumped to a rapid infiltration basin system located between Mud Creek and the Lake Fork arm of Cascade Lake. **See Figure 1, *Overall Vicinity Map* (Application 2006), attached.**
This application and updated maps requests a permit for the following reuse activities:

1. Permit renewal for the Eld Property, Field 1 for 65 acres
2. Permit renewal for the Stevens Property, Field 2 for 104 acres
3. Add new Stevens Field 3 for 35 acres (not included in this permit)
4. New permit for rapid infiltration site no. 1
5. New permit for rapid infiltration site no. 2 (not included in this permit)

SITE CHARACTERISTICS

General

The area served by this sewer collection and treatment system is shown in Figure 2-1, *Existing NLRSWD Collection System*. The slow rate reuse areas and the rapid infiltration (RI) sites are shown in Figure 1, *Overall Vicinity Map*.

Figure 3 rev, *Facility Site Map, Part A* (Application 2006) shows the slow rate land application fields, major public roads, nearby surface water, residences, and wells.

Figure 4, *Facility Site Map, Part B* (Application 2006) shows the two RI sites. **Figure 5, *Well Location Map*** (Application 2006) shows the homes with private wells located in the vicinity of the RI sites.

SOILS

Slow Rate Site

Based on the NRCS soil survey map, the Stevens fields has the following soil types: Donnel sandy loam, Melton loam, and Roseberry coarse sandy loam. The Eld field has Donnel sandy loam and Roseberry coarse sandy loam. Brief descriptions from the NRCS Valley County soil surveys follow:

Donnel sandy loam is a very deep, well drained soil. The surface layer is grayish brown, medium acid sand loam 15 inches thick. The subsoil is pale brown, medium acid coarse sandy loam to a depth of 20 inches. The layer from 20 to 35 inches is pale brown, slightly acid coarse sand loam. Below that, to a depth of 60 inches or more, is a pale brown, slightly acid and medium acid, sandy loam and loamy sand. Permeability is moderately rapid to a depth of 30 to 60 inches and rapid below this depth. The available water holding capacity is moderate and runoff is slow. The hazard of erosion is slight or less. The soil is used for oats, hay, seed potatoes, pasture, watershed, wildlife habitat, and recreation uses. Pasture is the most important use of this soil because of the short growing season.

Melton loam is a very deep, poorly drained soil. Typically, the surface layer is a strongly acid loam to 10 inches. The underlying material is a grayish brown strong acid loam to a depth of 25 inches. To a depth of 30 inches, it is a brown, strongly acid, gravelly sandy loam. Below 30 inches, cobbly outwash consisting of grayish brown loamy sand and cobblestones extend to a depth of 60 inches. Permeability is moderate in the surface layer to a depth of 30 to 35 inches and rapid below this depth. The available water holding capacity is moderate and runoff is slow. The hazard of erosion is slight or less. The high ground water table is 1 to 2 feet in the spring. The soil is used as rangeland and watershed and for wildlife habitat and recreation uses. Summer grazing is the most important use of this soil.

Roseberry coarse sandy loam is a very deep, poorly drained soil. Typically, the surface layer is a gray, medium acid coarse sandy loam to 13 inches. The underlying material is brownish gray and pale brown, medium acid loamy coarse sand to a depth of 35 inches. To a depth of 55 inches, it is brownish gray, medium acid, coarse sand. Below 55 inches, it is a light brownish gray, medium acid fine sandy loam.

Permeability is moderately rapid. The available water holding capacity is moderate and runoff is slow. The hazard of erosion is slight or less. The high ground water table is 1 to 2 feet in the spring. The soil is used for hay, pasture, wildlife habitat, limited woodland, and watershed. Hay and pasture are the most important use of this soil.

Additional information on these soils can be found in the Valley County soil survey. This document can be accessed at: http://soildatamart.nrcs.usda.gov/Manuscripts/ID652/1/id652_text.pdf

Rapid Infiltration Sites

The rapid infiltration sites no. 1 and 2 were investigated by STRATA Geotechnical Engineering and Materials Testing (Strata). Strata conducted field work to characterize the soil and ground water conditions at these two sites. The Strata reports summarizing these site investigations are contained in Application 2006, Appendix F.

Note: RI site no. 2 will not be considered for inclusion into the permit at this time. Plans and specifications for delivering effluent have been approved by DEQ for site no. 1 only. In addition, the Department of Army, Corps of Engineers letter dated July 26, 2006 recommends site no. 2 be re-delineated for wetlands and submitted to the Corps for review and approval prior to use for effluent disposal.

Soils, RI Site No. 1

The NRCS soil survey reports the soil types in the vicinity of the RI site no. 1 consist of Donnel sandy loam and Kangas fine gravelly loamy coarse sand. The Strata report, dated December 123, 2005, reported silty sand in the upper 4 feet of soil. This layer was underlain by poorly graded sand and poorly graded sand and gravel to a depth of approximately 19.5 feet. Poorly graded sand extended to a depth of 31.5 feet in the one soil boring that was extended to a further depth.

Ground water depth ranged from 7.5 to 9 feet below the ground surface in August 2005. Ground water flow direction is to southeast (115 degree Azimuth). High ground water table conditions typically occur in the spring during the winter melt conditions around April. Ground water conditions are discussed in more detail in the ground water section of this staff analysis.

Strata reported the effective infiltration rate at 4 test pits varied from 3 to 1,400 inches per hour. The approximate size of the RI basin site no. 1 is 15 acres and 14 separate basins are provided. The individual basins have an infiltration area of approximately 0.7 to 0.8 acres, with a total infiltration area of 9 to 10 acres. Application 2006, Appendix F states the proposed RI basin operation will be 1 day dose, 4 days rest in the summer and 1 day dose, 6 days rest in the winter.

Assuming 20% of the basin area is used on average (2.8 acres) and the worst case infiltration rate of 3 inches per hour, the site could infiltrate approximately 5.5 million gallons per day. Based on the infiltration rates, the site has adequate capacity to handle the design flow rate of the new MBR plant.

SURFACE WATER

Slow Rate Site

The Lake Fork arm of Cascade Lake is located approximately 1,200 feet west of the land application areas. Boulder Creek is located approximately 1,000 feet east of the treatment facilities and approaches in closer proximity to the south along the east boundary of the Eld property. It is separated from the land application field by the railroad that runs along the eastern boundary of the site.

An unnamed drainage ditch flow south through the Stevens property between fields 2 and 3 and continues south into the northwest portion of the Eld property. It is dammed up within the Eld property in field 1 and is used for supplemental irrigation water on the Eld field. It leaves the Eld property approximately midway on the western boundary.

RI Site No. 1
Mud Creek is located over 1,000 feet to the west of the site and the Lake Fork arm of Cascade Lake is located to the east of the site. During high water years, water backs up into the Lake Fork arm and may approach to within approximately 1,300 feet of the RI site. Ground water at the RI site flows southeast and is expected to discharge into the Lake Fork arm of Cascade Lake.

GROUND WATER

Slow Rate Site
The ground water depth ranges averages 6 to 10 feet below ground surface. During the spring, the application states ground water levels rise to within 4 feet of the surface. The NRCS Valley County soil survey reports ground water may reach 1 to 2 feet below ground surface in the spring and early summer. The regional ground water aquifer is located at a depth of approximately 100 feet. The direction of ground water flow is to the southwest.

Current ground water monitoring wells are located at the north boundary of the Stevens Field 2 and the northeast corner of the Eld Field 1. These monitoring wells serve as upgradient monitoring wells for each of these fields. During the DEQ inspection on August 24, 2006 the location of these two monitoring wells was confirmed.

Another monitoring well was reported to be installed in 2004 along the south border of Stevens Field 2, however it was not observed during the inspection. Another monitoring well was approved for construction near the south boundary of the Eld Field 1. However, it apparently has not been installed. This well is necessary as it provides for downgradient ground water monitoring for the Eld site. DEQ has requested the installation of this monitoring well in a letter to the District dated September 1, 2006 (Attachment 2). Table 2 shows the existing and future ground water monitoring wells for the slow rate and RI sites.

Table 2, Ground Water Monitoring Wells

Location	MW Designation	Permit Serial No.	Purpose
North boundary of Stevens Field 2	**MW-1**	**GW-07001**	Upgradient well for Stevens property
Southwest corner of Stevens Field 2	**MW-2**	**GW-07002**	Downgradient well for Stevens property
Northeast corner of Eld Field 1	**MW-3**	**GW-07003**	Upgradient well for Eld property
Southwest area of Eld Field 1 (status of installation uncertain)	**MW-4**	**GW-07004**	Downgradient well for Eld property
RI Basin Site No. 1 upgradient well (future)	**MW-5**	**GW-07005**	West of RI basin site no. 1 (plans to be submitted to DEQ)
RI Basin Site No. 1 downgradient well (future)	**MW-6**	**GW-07006**	East of RI basin site no. 1 (plans to be submitted to DEQ)
RI Basin Site No. 1	**MW-7**	**GW-07007**	Southeast of RI basin site no. 1

downgradient well (future)			(plans to be submitted to DEQ)

Tables 3, 4, and 5 contain ground water quality data from Application 2006:

Table 3, Stevens Upgradient Monitoring Well

Date	Water Depth, inches	Nitrate-N, mg/l	Total Phos., mg/l	TDS mg/l	Total Coliform count/100 ml
6/9/04	65	13.7	011	186	5
10/21/04	108	11.2	0.19	266	2
5/31/05	Not reported	8.8	<0.05	70	<1
7/26/05	Not reported	9.8	0.09	82	<2

Table 4, Stevens Downgradient Monitoring Well

Date	Water Depth, inches	Nitrate-N, mg/l	Total Phos., mg/l	TDS mg/l	Total Coliform count/100 ml
5/13/04	58	NR	0.08	114	93
10/21/04	68	0.3	0.05	110	280
5/31/05	Not Reported	1.2	<0.05	62	<1
10/20/05	Not Reported	0.4	0.12	52	<2

Table 5, Eld Upgradient Monitoring Well

Date	Water Depth, inches	Nitrate-N, mg/l	Total Phos., mg/l	TDS mg/l	Total Coliform count/100 ml
5/13/04	63.5	NR	0.18	258	23
10/21/04	Not Reported	NR	NR	NR	NR
5/31/05	Not Reported	<0.2	0.34	104	<1
10/20/05	Not Reported	NR	NR	NR	NR

The Stevens upgradient well indicates there is a high level of ground water nitrate coming onto the site from the north. The nitrate values ranged from 8.8 to 13.7 mg/l. The total phosphorus values ranged from <0.05 to 0.19 mg/l.

Based on the limited data available for the Stevens downgradient well, it appears ground water nutrient levels decrease across the Stevens property. In addition, the ground water TDS levels decreased across the Stevens site for each of the reported sample events.

The Eld upgradient monitoring well had limited data reported. One nitrate value was reported in 2005 at <0.2 mg/l. The total phosphorus level was 0.18 in May 2004 and 0.34 mg/l in May 2005. No Eld downgradient ground water monitoring data was reported and it is unknown at this time if this monitoring well was installed.

All three monitoring wells had elevated bacteria levels in some sample events. This is not unexpected based on the shallow depth of the ground water (5 to 8 feet below ground surface when the samples were taken). The short distance for water infiltration before it reaches shallow ground water may transport

bacteria. The shallow ground water is not used for any potable purposes and Figure 3, *Facility Site Map, Part A* (Application 2006) shows there no private wells near the southern boundary of the slow rate fields. The current permit requires ground water sampling in April and October. Staff recommends the sampling frequency remain the same for the slow rate sites.

RI Site No. 1

Table 6 contains ground water depth information reported in test pits around this site in August 2005 and May 2006:

Table 6, Ground Water Depth, RI Basin Site No. 1

Test Pit	August 2005 feet BGS	May 2006 feet BGS	Notes
1	17.6	9.3	Located ~75 feet south of RI site
2	9.1		Located ~600 feet east of RI site
3	12.6	4.3	Located ~750 feet north of RI site
6	10.2		Located ~600 feet northeast of RI site

Ground water flow direction is to east southeast. High ground water table conditions typically occur in the early spring during the winter melt conditions around April. As noted in Table 6, the ground water level was approximately 8 feet higher in May 2006 versus August 2005 in test pits nos. 1 and 3. The spring of 2006 was reported to be a much wetter year than typical.

Keller Associates submitted an analysis of ground water mounding at the RI basin site prepared by A. T. Wallace, dated June 27, 2006 (contained in Application 2006). This analysis estimated the ground water mounding at an effluent flow rate of 1 MGD would approach 2 feet.

Staff has concerns that during years with wet spring conditions, the ground water table may be a limiting factor when the system reaches design conditions. For example, at test pit no. 3, ground water was within 4.3 feet of the surface in May 2006. Operation of the RI system at design rates may increase the ground water table by approximately 2 feet. If there is an accumulation of snow and ice in the basins adding to the water to be infiltrated, there may be problems infiltrating water at design rates. Actual operation of the system will determine if limitations exist.

The District estimates the system will approach design flow rates in the year 2025. Table 7 contains estimates of the flow rates to the RI Basins from Application 2006.

Table 7, Flow Rate to RI Basin Site No. 1

Year	Million Gallons per Year of Effluent to RI Basins	Million Gallons per Day of Effluent to RI Basins
2009	24.8	0.07
2011	77.4	0.21
2013	130.0	0.36
2015	182.7	0.50
2025	259.8	0.71

Therefore, the flow rate to the RI basins will be well below the 1 MGD flow rate used for the ground water mounding analysis for the duration of this permit. Therefore, staff believes the proposed system has adequate capacity as designed for the duration of this permit.

Staff recommends ground water monitoring wells be installed around the RI basin site to monitor ground water quality and elevations to determine if the ground water conditions are as predicted. Sampling frequency at the RI basin site may be greater during initial operation to characterize ground water quality conditions throughout the year. Once ground water quality impacts are characterized, the frequency may be reduced.

Further information on this site is contained in the report prepared by Strata, Inc. dated December 23, 2005 (Strata 2005) in Application 2006, Appendix F.

Private and Public Wells

Figure 3, *Facility Site Map, Part A* (Application 2006) shows private and public wells located around the slow rate land application site. Figure 5, *Well Location Map* (Application 2006) show wells located near the RI sites.

WASTEWATER HYDRAULIC LOADING RATES

Hydraulic Loading Rate, Slow Rate Site

Table 8 shows the projected wastewater volume for slow rate application from Application 2006.

Table 8. Projected Wastewater Volume to Slow Rate Sites

Year	Million Gallons to Slow Rate Application	Inches per year to Slow Rate Application [1]
2005	31.2	6.80
2008	88.5	19.29
2015 & 2025	90.1	19.63

[1] Based on 169 acres of slow rate application area (Stevens field 2, 65 acres, Eld field 1, 104 acres) and even application over the entire area.

The DEQ *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater* (DEQ Guidance) recommends the growing season hydraulic loading rate be based on the agronomic need of the crop grown. This value is defined as the Irrigation Water Requirement (IWR) and is calculated as follows:

$IWR = IR_{net}/E_i$, where IR_{net} is the net irrigation requirement and E_i is irrigation efficiency.

$IR_{net} = C_U - (PPT_e$ + carryover soil moisture) + LR, where Cu is crop consumptive use, PPT_e is effective precipitation, and LR is the leaching requirement. For IWR estimations, DEQ assumes no leaching requirement allowance and no carryover soil moisture entering the irrigation season.

DEQ uses *Estimating Consumptive Irrigation Requirements for Crops in Idaho* by R.G. Allen and C.E. Brockway, University of Idaho, 1983 for IR_{net} data. This data can be access at the following website: http://www.kimberly.uidaho.edu/water/appndxet/index.shtml
The IR_{net} and IWR for the two locations nearest to this site (McCall and Cascade) are as are shown in

Table 9.

Table 9. IWR for Pasture near McCall and Cascade

Station	IR_{net} for pasture, inches[1]	IWR for pasture, inches @80% irrig. Efficiency	Irrigation Season
McCall	22.40	28.00	May through part of October
Cascade	24.76	30.95	Late April through mid-October
Avg. of McCall and Cascade	23.58	29.48	

[1] Date from *Estimating Consumptive Irrigation Requirements for Crops in Idaho*, R.G. Allen and C.E. Brockway, University of Idaho, 1983: http://www.kimberly.uidaho.edu/water/appndxet/index.shtml

Table 8 shows the projected hydraulic loading rate at year 2015 on 169 acres is 19.63 inches. This is less than the estimated IWR for pasture in McCall and Cascade (28.00 to 30.95 inches). Therefore, 169 acres is a sufficient area for the anticipated volume of effluent to slow rate land application assuming the entire area is used to apply effluent. A small volume of supplemental irrigation water may be required to meet the IWR.

The existing permit specifies a growing season from May 1 through October 15. The permit application states the anticipated irrigation season is June through September. Staff recommends the growing season in the renewal permit remain the same (May 1 through October 15, 168 days) as long as the O&M manual addresses irrigation scheduling based on agronomic need.

Non-Growing Season Hydraulic Loading Rate, Slow Rate Site

The permit application does not request application of effluent at the slow rate site during the non-growing season and none will be allowed in the renewal permit.

Hydraulic Loading Rates, RI Basin Site No. 1

The District is planning to provide additional treatment capacity with the construction of a membrane bioreactor (MBR) system with ultraviolet disinfection and discharge to RI Basins. The RI Basin is designed for year-round operation. The estimated volume of effluent to the RI basin site is summarized in Table 7, page 8.

The RI basin system is designed to eliminate the need to provide additional non-growing season storage as the population served by the District grows. Excess effluent from the MBR system may be diverted to the slow rate lagoon system if capacity is available.

However, effluent from the lagoon system cannot be discharged to the RI basin system. The RI basin system was designed based on infiltration of Class B effluent and the lagoon system produces Class C effluent with higher nitrogen and phosphorus levels.

WASTEWATER CONSTITUENT LOADING RATES

Constituent Loading Rates, Slow Rate Site

The projected volume of effluent for application at the slow rate sites is provided in Table 8, page 9. The typical effluent quality from the lagoon treatment system from Application 2006 is shown in Table 10.

Table 10. Lagoon System Effluent Quality

Parameter	Average Concentration, mg/L	Note
Total Kjeldahl Nitrogen	11.5	
Nitrate + Nitrite Nitrogen	0.12	
Total Nitrogen	11.6	
Total Phosphorus	3.89	
TDS	347	
BOD	See note	Values were <16, <10, <16, and 24 mg/L
COD	See note	Application 2006 reports expected COD concentration of 50 mg/L based on BOD data

Average effluent quality from Application 2006, Part A, page 8.

Based on application of 90.1 million gallons of effluent (year 2025) from the lagoon system on 169 acres, the resulting loading rates are shown in Table 11.

Table 11. Constituent Loading Rates, Slow Rate Site, Year 2025

Parameter	Pounds/year[1]	Pounds/acre[2]	Note
Total Nitrogen	8,717	51.6	Typical permit limit is 150% of crop uptake.
Total Phosphorus	2,923	17.3	No permit limit unless soil or ground water phosphorus concentrations are elevated.
TDS	260,748	1,543	
COD, Growing Season average	37,572	222.3	1.32 lb/acre-day. Typical permit limit is 50 lbs/acre-day.

[1] Based on 90.1 million gallons and the effluent concentrations in Table 10.
[2] Based on application on 169 acres

Constituent Loading Rates, RI Basin Site No. 1

The projected volume of effluent for application at the RI Basin site is provided in Table 7, page 8. The MBR system is designed for an effluent quality of less than 10 mg/L total nitrogen and 0.1 mg/L or less total phosphorus. Based on the year 2025 volume of effluent to the RI Basins (259.8 million gallons), the nitrogen and phosphorus loading rates are shown in Table 12.

Table 12. Constituent Loading Rates, RI Basin Site No. 1, Year 2025

Parameter	Pounds/year[1]

Total Nitrogen	21,667
Total Phosphorus	220

[1] Based on 259.8 million gallons per year and a total nitrogen concentration of 10 mg/L and a phosphorus concentration of 0.1 mg/L.

The ground water nitrate impacts from RI basin operation are modeled in Strata 2005 and shown in Plates E1 (year 2008), E2 (year 2015), and E3 (year 2025). Strata 2005 states the nitrate concentration in the shallow ground water will be increased over background, but will be below the ground water quality standard of 10 mg/L for nitrate. The modeling indicates the nitrate concentration will increase from 2 mg/L to approximately 8 mg/L immediately downstream of the RI basins and will discharge to the Lake Fork arm of Cascade Lake. Since this system is being considered as a system with a direct connection to surface and the District is being required to prevent any potable use of the shallow water prior to discharge to surface water, the ground water quality standards do not apply.

Application 2006 states the ground water phosphorus concentration levels are expected to decrease across RI basin site. Ground water samples taken from test pits had an average phosphorus concentration of 0.6 mg/L. The MBR treatment system is being designed for an effluent concentration of 0.1 mg/L or less. As shown in Table 12, the estimated mass loading rate of phosphorus to the RI basins will be 220 pounds per year (100 kilograms per year) at design conditions (year 2025).

Application 2006 justifies the RI basin phosphorus loading rate by the elimination of phosphorus contributions to the watershed via elimination of septic tank systems and reductions in agricultural non-point contributions. Refer to the letter from DEQ to Susan Burnham dated February 1, 2006 (Attachment 3). This letter estimates 959 pounds per year of phosphorus (436 kilograms per year) will be removed from the watershed through abandonment of septic tanks and agricultural non-point source reductions. The draft permit requires reporting of septic tank system abandonment to document this source of phosphorus has been eliminated from the watershed.

The estimated net phosphorus reduction to the watershed with the RI basin system is projected to be 739 pounds per year (336 kilograms per year) at design conditions. The DEQ surface water quality program has determined this analysis is valid and will be in compliance with the intent of the Cascade Lake TMDL plan.

SITE MANAGEMENT

Buffer Zones, Slow Rate Site

The lagoon effluent quality is designed to meet Class C requirements as defined in the Reuse Rules. The DEQ Guidance, section 6.5 contains buffer zone distances for Class C systems in residential areas. These buffer zones are shown in Table 13 and will be specified in the renewal permit.

Table 13. Buffer Zones for Slow Rate Sites

Buffer Object	Minimum Buffer Distance, feet[1]
Homes	300
Public Access Areas	50
Private potable water supply wells	500
Public water supply wells	1,000

Natural surface water	100
Irrigation ditches and canals	50

[1] Alternative buffer distances may be proposed with technical justification provided by the District and acceptance by DEQ.

The slow rate site requires fencing and warning signs around the perimeter of land application fields at 500 foot intervals.

Buffer Zones, RI Basin Site

The DEQ Guidance does not contain buffer zone recommendations for homes and public access areas for rapid infiltration systems. However, the DEQ Guidance, sections 6.5 and 6.6.3 discusses protection of wells for all wastewater land treatment systems, including rapid infiltration systems and recommends the minimum buffers zones shown in Table 15.

Table 15. Buffer Zones for Rapid Infiltration Sites using Class B Effluent

Buffer Object	Minimum Buffer Distance, feet
Private potable water supply wells	500
Public water supply wells	1,000

These buffer zones will be specified in the permit for the RI basin site. Alternative buffer distances may be proposed with technical justification provided by the District and acceptance by DEQ. The direction of ground water flow and confining layers may be considered in this analysis.

In addition, DEQ will specify fencing and warning signs be placed around the RI basin site.

Waste Management Plans

FPS 2006, section 7.3 states biosolids from the MBR treatment system will initially be wasted to lagoon system cell 1. This section of the facility plan also states the schedule for future solids handling facilities is to complete the design and obtain bids for construction by August 2007 and to have the facilities operational no later than September 2009. A compliance activity to address future biosolids treatment and disposal plans will be included in the permit.

Grazing Management Plans

Both of the slow rate sites conduct grazing activities. The Stevens site is used for pasturing 25 to 45 horses and the Eld site is used to graze up to 20 pairs of cattle for fall cleanup after final harvest. Application 2006, Appendix E contains the proposed grazing management plan for both of these sites. The plan appears to meet the recommendations contained in the DEQ Guidance for grazing plans.

Runoff Management Plans

No runoff is allowed from any site or fields used for wastewater slow rate irrigation, except after a 25-year, 24-hour storm event or greater. Staff recommends both the Eld and Stevens properties be evaluated for compliance with this requirement. If the permitted fields are not in designed to contain the design storm event, staff recommends the inclusion of a compliance activity to construct, operate, and maintain control structures and other BMPs to contain the design storm event.

Past Issues Regarding Operations

In the past, the District has not adequately maintained control over the slow rate land application operations. Staff recommends an updated O&M manual be submitted to DEQ for review and approval,

within 6 months of permit issuance. The manual should specifically address responsibilities regarding irrigation practices with both effluent and supplemental irrigation water for both the Stevens and Eld sites.

COMPLIANCE ACTIVITIES

Staff recommends the following compliance activities be included in the draft permit:

1. Revised agreements between landowners (Stevens and Eld) and the District are required to reflect requirements of the new permit.
2. The District must provide documentation of control of property downgradient (from a ground water flow perspective) of RI basin site no. 1 and the ability to restrict the installation of any well for drinking water purposes in this area.
3. Completion of ground water monitoring wells for the slow rate site as outlined in DEQ correspondence to the District dated September 1, 2006.
4. Completion of ground water monitoring wells prior to startup of the RI basin site no. 1 as outlined in DEQ correspondence to the District dated September 1, 2006.
5. Completion of flow meter installation as necessary to monitor application rates at the slow rate system.
6. Waste solids management plan for future biosolids treatment and disposal.
7. Runoff management plan, including construction of control facilities if necessary.

RECOMMENDATION

Staff recommends a reuse permit be developed for this facility, incorporating requirements outlined in this staff analysis.

ATTACHMENTS

Attachment 1, Figures

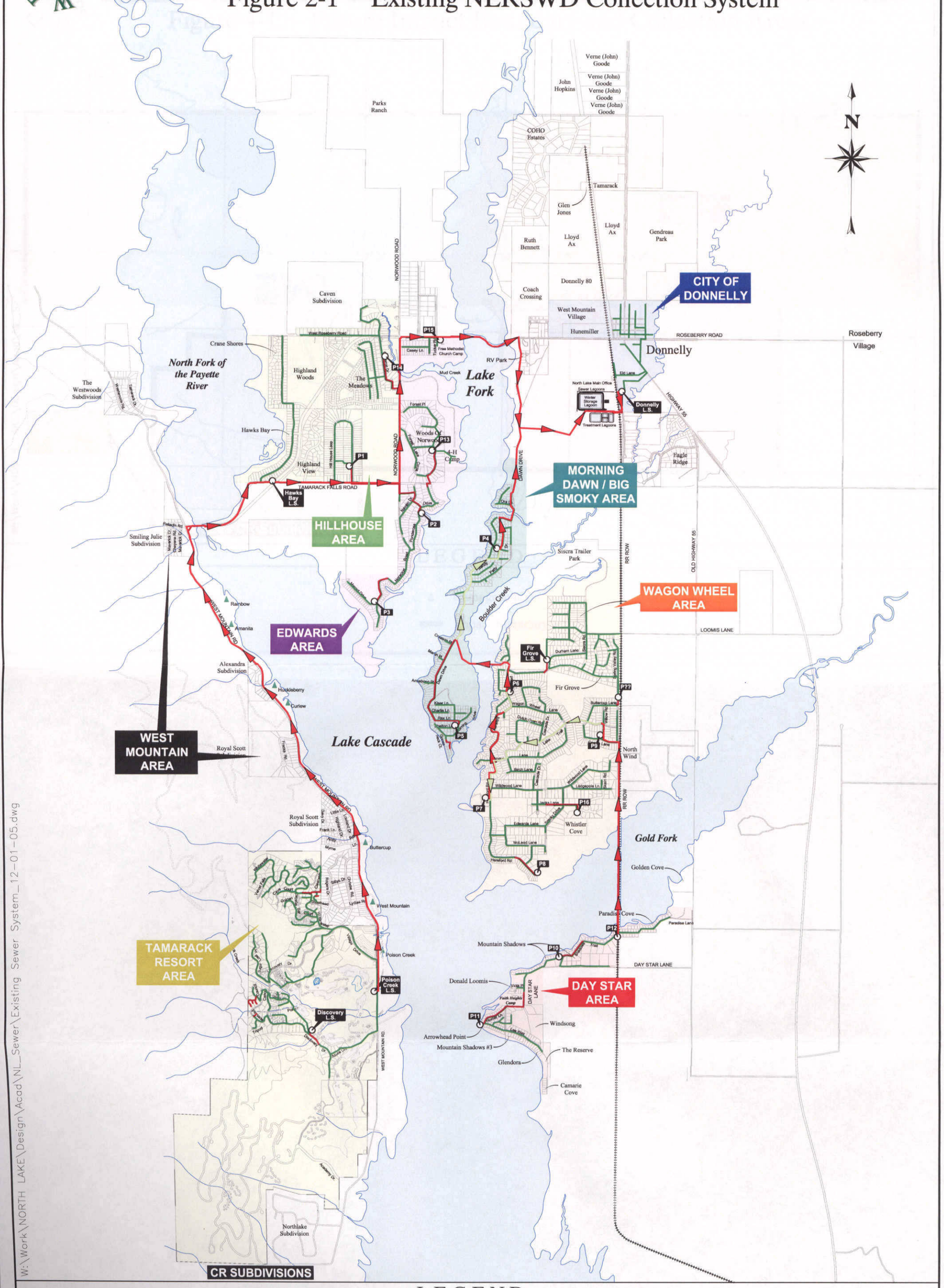
- Figure 2-1, *Existing NLRSWD Collection System* (Collection System 2006)
- Figure 1, *Overall Vicinity Map* (Application 2006)
- Figure 3 rev, *Facility Site Map, Part A* (Application 2006) shows slow rate land application fields, major public roads, nearby surface water, residences, and wells.
- Figure 4, *Facility Site Map, Part B* (Application 2006) shows the two RI sites.
- Figure 5, *Well Location Map* (Application 2006) show wells located near the RI sites.

Attachment 2, DEQ letter to District dated September 1, 2006

Attachment 3, DEQ letter to Keller Associates, dated February 1, 2006

NORTH LAKE RECREATIONAL SEWER & WATER DISTRICT

Figure 2-1 Existing NLRSWD Collection System



LEGEND

- Lift Station
- Gravity Sewer
- Pressure Sewer
- Campground

W:\Work\NORTH LAKE\Design\Acad\NL_Sewer\Existing Sewer System_12-01-05.dwg

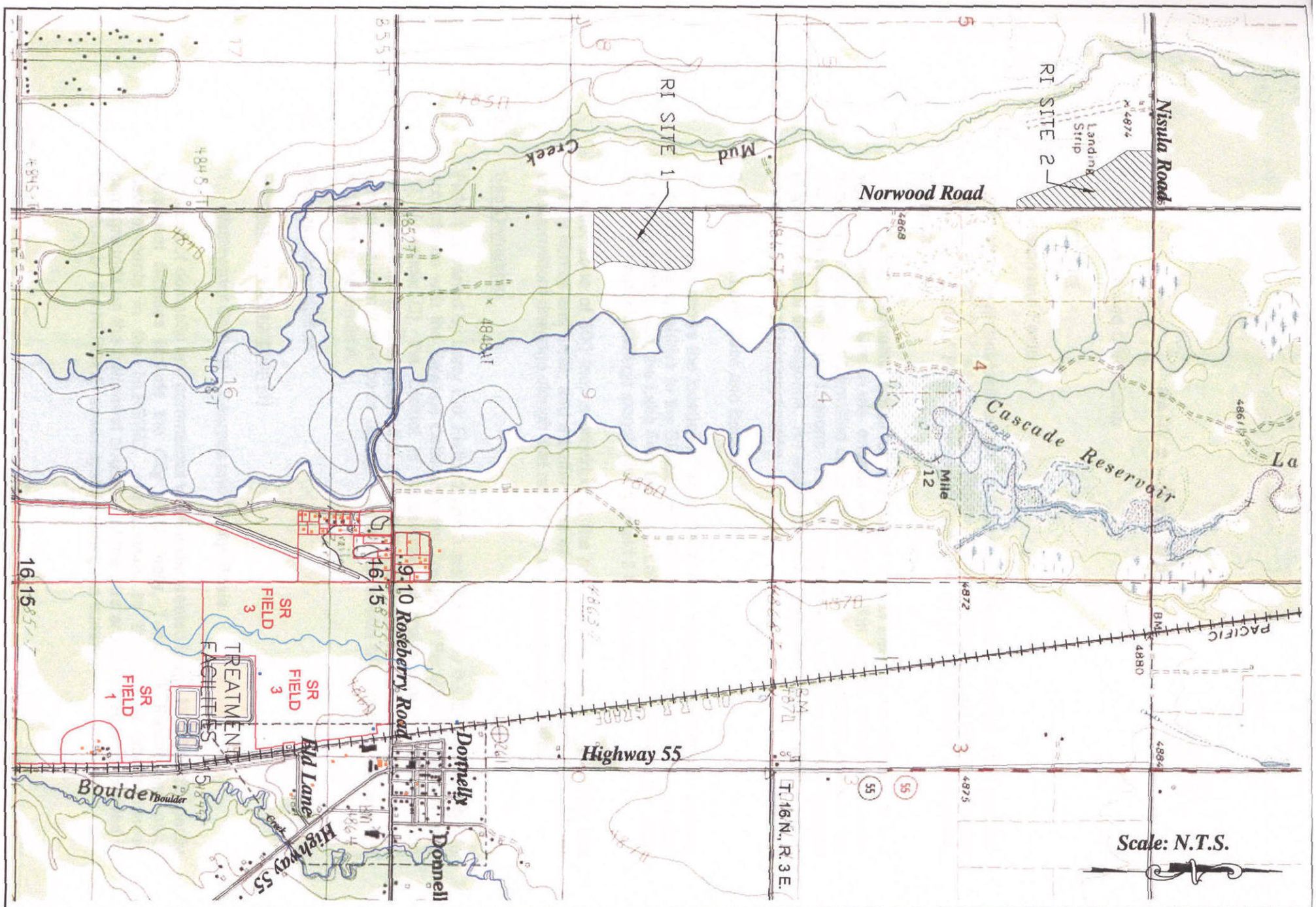
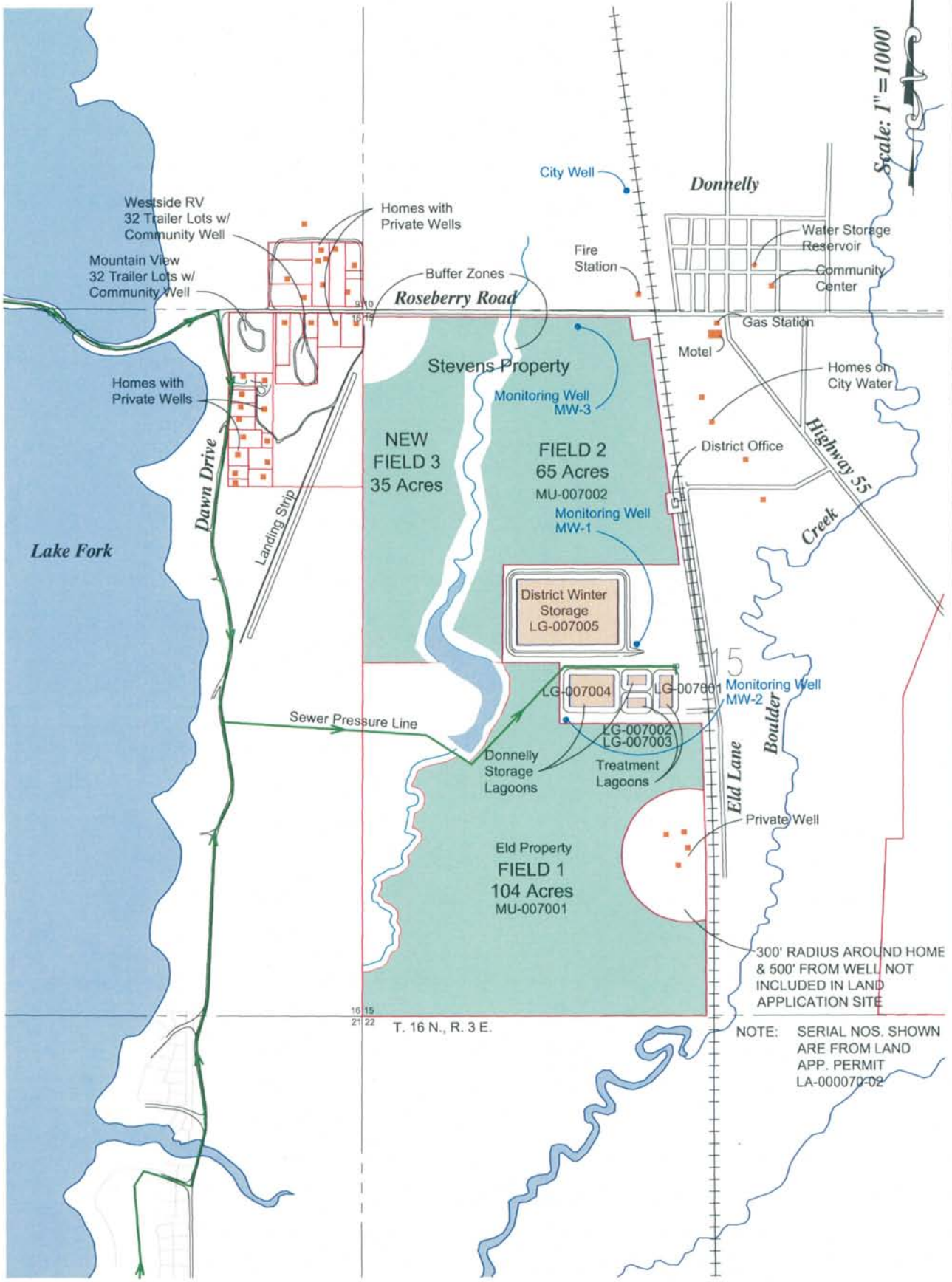


FIGURE NO.				
1	WLAP Application Overall Vicinity Map	North Lake Recreational Sewer & Water District	KELLER ASSOCIATES 131 SW 5th Avenue, Suite A Meridian, Idaho 83642 (208) 288-1992	PROJECT NO. 105050 FILENAME Overall Vicinity.dwg



PROJECT NO. 105050

FILENAME Land App. 11-8.dwg

KELLER ASSOCIATES
131 SW 5th Avenue, Suite A
Meridian, Idaho 83642
(208) 288-1992

North Lake Recreational Sewer & Water District

WLAP Application

Facility Site Map (Part A)

FIGURE NO. 3 rev

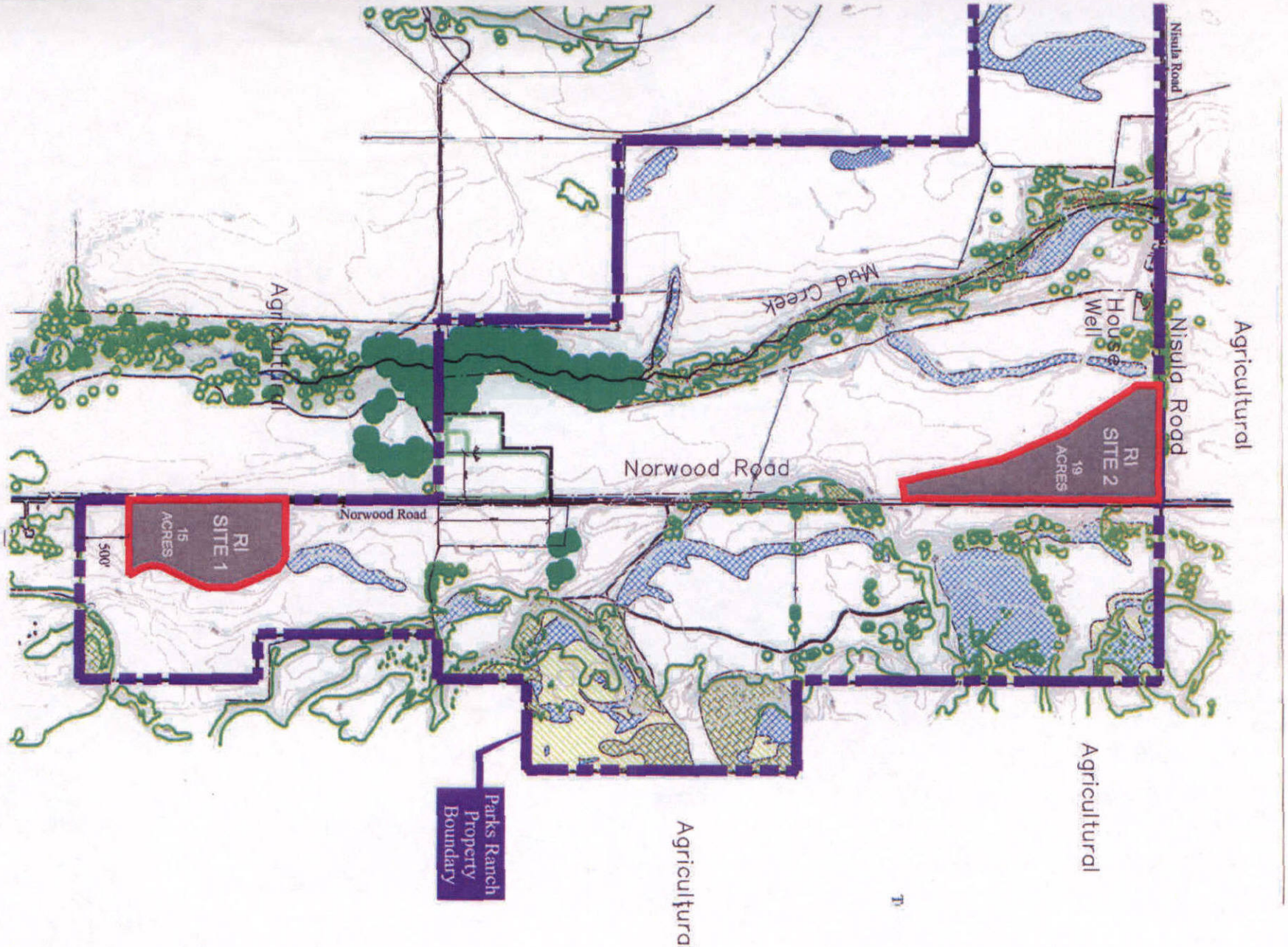


FIGURE NO.				
4	*WLAP Application* *Facitlity Site Map - (Part B)*	*North Lake Recreational Sewer & Water District*	KELLER ASSOCIATES 131 SW 5th Avenue, Suite A Meridian, Idaho 83642 (208) 288-1992	PROJECT NO. 105050 FILENAME RI Site Map.dwg

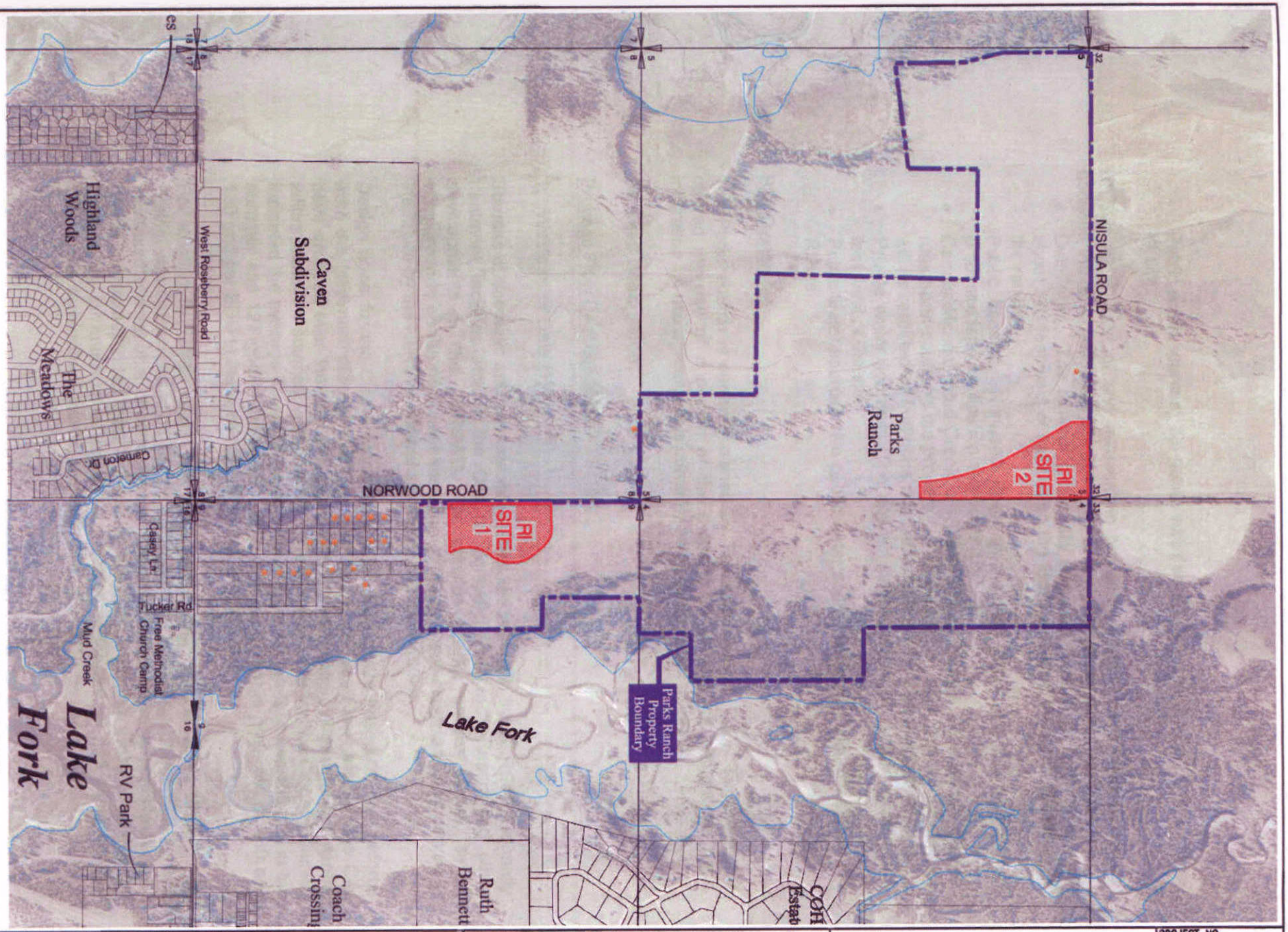


FIGURE NO.				
5	*WLAP Application* *Well Location Map*	*North Lake Recreational Sewer & Water District*	KELLER ASSOCIATES 131 SW 5th Avenue, Suite A Meridian, Idaho 83642 (208) 288-1992	PROJECT NO. 105050 FILENAME 105050WellLoca.dwg

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1445 N. Orchard • Boise, Idaho 83706 • (208) 373-0550

Dirk Kempthorne, Governor
Toni Hardesty, Director

September 1, 2006

Mr. Bill Eddy, Administrator
North Lake Recreational Sewer & Water District
P. O. Box 729
Donnelly, Idaho 83615

RE: Wastewater Reuse Permit Application, Permit No. LA-000070-03

Dear Mr. Eddy:

The Department of Environmental Quality (DEQ) conducted an inspection at the North Lake Recreational Sewer & Water District (NLRSWD) wastewater treatment plant, slow rate land application system, and the proposed site for the new rapid infiltration basins on August 24, 2006.

The following items were noted:

1. DEQ approved plans for construction of ground water monitoring wells for the slow rate site in 2003. The Holladay Engineering Company (HEC) submitted correspondence (attached) on September 19, 2003, stating monitoring wells 1, 3 and 4 were installed and that monitoring well no. 2 was to be installed shortly. During the inspection, only two of these wells were located (MW-1 at the north end of the Stevens field and MW-3 at the NE corner of the Eld field). As noted in the HEC letter, MW-4 near the south boundary of the Eld Field was apparently installed.

   Please arrange to have monitoring wells 2 and 4 installed according to the previously approved plans in the locations shown in the September 19, 2003, correspondence or provide confirmation they have been installed. These wells provide the downgradient ground water quality for Stevens and Eld properties respectively. DEQ cannot re-issue this permit until these monitoring wells are in place.

2. DEQ has not received an annual report as required by the current permit LA-000070-02 for the past three years. This is a serious violation of the permit requirements since the annual reports are necessary to evaluate compliance with the permit. Please ensure data is being collected for the 2006 annual report.

3. No flow meter is available to monitor the volume of effluent applied to the Eld or Stevens fields. We asked Keller Associates to investigate the installation of flow measuring device(s) to meet annual reporting requirements.

4. The operators indicated that Mr. Eld operates the irrigation system when applying effluent to his field, including the chlorine disinfection system. Operation of the land application system must be done under the control and responsibility of the certified wastewater treatment operator. Please notify Mr. Eld to clarify responsibilities. DEQ will require attendance of Mr. Eld and Mr. Stevens at the permit handoff meeting to discuss the permit requirements.

5. As discussed with Keller Associates during the inspection, the supplemental irrigation water system for the Eld site needs to have a backflow prevention device installed or provide operating procedures to provide an air gap at the supplemental irrigation water connection when the effluent is being used to irrigate the Eld site.

6. The proposed site no. 1 for the rapid infiltration basin (RIB) system was inspected, including the expected ground water discharge areas downgradient of the RIB system. In order to evaluate future RIB performance and ground water impacts, current ground water conditions and quality need to be established.

   DEQ will require the installation of ground monitoring wells during this construction season in order to gather sufficient data to establish current conditions. Please have your consultant submit plans for the installation of ground water monitoring wells (a minimum of one upgradient and two downgradient of the RIB system). Ground water monitoring well construction guidance is located at the following link in Chapter 7 starting on page 7-76.

   http://www.deq.idaho.gov/water/permits_forms/permitting/guidance.cfm

If you have any questions about these requirements, please call me at (208) 373-0550, or contact me by email at Charles.Ariss@deq.idaho.gov.

Sincerely,

Charles W. Ariss

Charles W. Ariss, P.E.
Regional Engineering Manager

Attachment

Cc: Michael McGown, Administrator, Boise Regional Office
Jon Sandoval, Environmental Management and Information Administrator, State Office
Paul Wakagawa, P.E., Boise Regional Office
Jack Gantz, P.E., Boise Regional Office
Susan Burnham, P.E./Nate Cleaver, Keller Associates
Rick Huddleston, P.E., Water Quality Program, State Office
Tressa Nicholas, Boise Regional Office
WLAP File LA-000070-03, State Office
BRO File 17.3, NLRSWD, LA-000070, Reading File

NLRSWD
5

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1445 N. Orchard • Boise, Idaho 83706 • (208) 373-0550

Dirk Kempthorne, Governor
Toni Hardesty, Director

February 1, 2006

Susan K. Burnham, P.E.
Keller and Associates
131 S.W. 5th Avenue, Suite A
Meridian, Idaho 83642

RE: North Lake Sewer & Water District / Donnelly
Phase II Wastewater Treatment Facilities

Dear Ms. Burnham:

Thank you for meeting with me today to discuss the phosphorus reductions that could be realized once Phase II of this project is completed. In our meeting, we discussed the reductions from septic tanks and agriculture that the project could potentially provide. The following table is a projection of the phosphorus removal from the Lake Cascade watershed. These numbers are based on the table included in the summary dated December 20, 2005. After reviewing the table again, it has been decided that credit should not be given for "Exist" entries under the *Recent and Future Annexations* heading. This reduces the potential load from 430 kg/year to 357 kg/year.

Treatment Plant – Bio + Chem P removal (0.1 mg/L)	**Phosphorus to Watershed, kg/yr (at build out)**	
Septic system elimination	-357	
Ag Nonpoint Source Reduction	-79	
RI Basins	+100	
Net P Load	-336	
P Load from septic tanks	963*	2205**
% Reduction	34.9%	15.2%

*Septic tank load left to be removed in the watershed.
**Original predicted septic tank load in the watershed

With this in mind, the project will remove in the range of 15.2 to 34.9% of the total phosphorus contributed to the watershed by septic tanks. It is my opinion that this reduction meets the intent of the TMDL for Lake Cascade.

If I can provide any other information, please contact me.

Sincerely,

Craig Shepard
Regional Manager
Water Quality

cc: Mike McGown, DEQ BRO Regional Administrator
Chas Ariss, DEQ BRO Engineering Manager